COAL NONFATAL

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

DISTRICT 9

ACCIDENT INVESTIGATION REPORT
(UNDERGROUND COAL MINE)

NONINJURY FALL OF FACE (COAL OUTBURST) ACCIDENT

Dutch Creek Mine (I.D. No. 05-00301)
Mid-Continent Resources, Inc.
Redstone, Pitkin County, Colorado

September 24, 1990

by

David L. Head
Coal Mine Safety & Health Inspector (Electrical)

Originating Office - Mine Safety and Health Administration
215 East Main Street, Price, Utah 84501
Tony Gabossi, Acting Subdistrict Manager

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GENERAL INFORMATION

The Dutch Creek Mine, is an underground coal mine located 4 miles west of Redstone, Pitkin County, Colorado, off State Route 133.

Currently, Mid-Continent Resources, Inc., operates one active underground coal mine. Five active mines were in production status prior to 1984. On July 1, 1988, the Dutch Creek No. 1 and No. 2 mines were consolidated under a single identification number after parallel rock adits, popularly called tunnels, were driven from the surface to access the two coalbeds; Coal Basin "B" and Dutch Creek "M". Each tunnel is approximately 3 miles in length. The south rock tunnel is dedicated to the transportation of men and materials. Coal is transported by conveyor belts through the north rock tunnel.

Seven main sloped entries were developed down dip, in a westerly direction in each coalbed. The coalbeds pitch about 10-12 degrees to the southwest. Panels were developed north and south off the main slopes along the strike of the coalbed. Multiple entries, generally in sets of 4, were driven about 18 feet wide on varying center dimensions with connecting crosscuts. Pillars were extracted using a split and fender method with remote controlled continuous mining machines. Advancing and retreating longwall panels were developed in a northerly direction off the main slopes beginning in 1976.

The 101 longwall section was completed in July 1980 after being advanced about 3,750 feet. The second advancing longwall, designated as the 102 longwall section commenced mining in January 1981 and was completed after being advanced about 4,000 feet. The third and current advancing longwall designated as the 103 longwall section has been developed approximately 660 feet.

The 103 longwall assembly is about 825 feet in length and mines a coal face height of nine to ten feet.

Roof control of the roof is accomplished by a combination of longwall shields, roof bolts, and timber supports. The longwall shield supports were manufactured by Hemscheidt of West Germany. There are 163 shield supports on the longwall face. The 103 longwall section has one production shift and two maintenance shifts, and normally works five days a week, Monday through Friday. Production work is performed on the graveyard shift. The 103 longwall section usually has three crews on the production shift. They are supervised by the longwall production and packwall foremen. The average daily coal production is approximately 1,200 tons.

The mine has been under the restrictions of a 103(k) order since August 18, 1990, due to a methane gas fire in the 211 longwall section gob area and the tailgate return entry.

A total of 300 miners are employed; 210 work underground on 3 rotating shifts per day, 7 days per week. The average daily production, 4,400 tons of coal, is loaded from three advancing longwall sections.

Ventilation of the mine is induced by two axial-flow fans, numbers 12 and 4, properly installed on the surface of Coal Basin "B" and Dutch Creek "M" coalbeds. The two fans are equipped with all necessary safety devices and operate

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mine about 7:00 a.m., on September 24, 1990. They traveled in a self-propelled personnel carrier and arrived in the section about 7:35 a.m. The section experienced minor electrical problems throughout the shift, but the difficulties did not prevent normal mining activities from commencing shortly after 8:10 a.m., and continued until 1:40 p.m. At that time the mining crew was cutting coal using an 18 inch advance cut (British standard method of relieving methane gas). The shearer was at shield number 93 when two small bounces occurred and concentrations of methane gas were detected by the face monitors. The monitors immediately deenergized all section electrical power. The bounces were accompanied by audible cracking sounds and served as an immediate warning of a stress release; generally a coal outburst known as a "push".

Realizing a "push" was imminent, the shearer operators began to run toward the headgate area. As they did, a coal outburst occurred behind them. The outburst threw some coal into the conveyor panline and against the face-side of the shearer. The outburst was of a low range magnitude and no personal injuries or property damage was suffered as a result of the accident.

During the investigation, the advancing longwall was about 825 feet in length and the face height was 9 to 10 feet. There are 163 Hemscheidt shield supports on the longwall face.

Multiple boreholes had been drilled in the coal face of the advancing longwall section to detect and relieve excessive stress. The boreholes were drilled to a depth of about 15 feet in the face on 5 feet centers filled with permissible explosives and stemmed with water dummies. The volley fire shots were fired immediately after charging on the first shift, on Sunday, September 23, 1990, at approximately 10:14 p.m.

The coal outburst accident involved an area approximately 50 feet in length between shields number 94 and 105. The shear operators were mining coal on the third pass, cutting coal with half a shear (approximately a two foot cut.)

The stressed area was undetected by visual observations and stress detection practices. The accident occurred in an area where stress forces had not been previously located. The loose coal from the coal outburst was removed from the shearer and panline when the investigation was completed.

During the investigation, ventilation readings were taken in the intake roadway, the conveyor beltline, and immediate return entries. There was 183,465 cubic feet of air per minute being delivered to the intake end of the longwall face. 150,220 cubic feet of air per minute was measured in the return entry.

PHYSICAL FACTORS INVOLVED

1. The coalbed is the 103 longwall section is 9 to 10 feet in height and is being totally extracted.

2. The 103 advancing longwall section is a two-entry system. The headgate entries consist of a conveyor beltline entry and the headgate roadway entry, which are used as intake air courses.

3. The longwall assembly consists of 163 Hemscheidt shields (two-legged), a Halbrach and Braun armored face conveyor, and an Eickhoff 300 Shearer.

4. The company instituted a stress-relief program in 1975. This program consists of drilling 3-inch holes 40 to 100 feet in length into the stressed coal face and placing hydraulic hoses into them. These hoses are then charged with longwall emulsion fluid under high pressure, 3,200 psi, which serves to hydraulically fracture the surrounding coal and lubricate the associated slip planes. This breaking action is intended to relieve the built-up stress in a controlled manner.

   The company also "volley fires" the coalbed. The program utilizes boreholes, 50 millimeters in diameter, drilled into the longwall face to a depth of about 15 feet on 5 foot center distances. Each hole is loaded with 3 pounds of permissible explosives and detonated simultaneously. The purpose is not to displace the coal, but to fracture it in place. Fracturing the coal forces the energy stored in the coalbed to move from the face, back into the solid block, inby and away from the face.

   Records indicated that volley firing was last performed at 10:14 p.m., September 23, 1990, about 15 hours before the coal outburst.

5. The 103 longwall section is located adjacent to the mined out 101 and 102 longwall panels and is overlain by the 211 advancing longwall panel in the Dutch Creek "M" bed.

   The two coalbeds and associated mining activities are not vertically aligned. The interburden about 480 feet in thickness, is composed of a predominantly strong sandstone member which separates the two coalbeds. This member, in conjunction with the overburden ranging from 2,200 feet to 2,500 feet, creates severe stress effects on both coalbeds.

6. Abrupt changes of topography had contributed to the stress and pressure load encountered in the 103 longwall section. Mountain peaks of the Elk Mountain Range predominantly figure in the surface features over the Dutch Creek Mine.

7. Historically, the coalbeds of the Dutch Creek Mine are prone to outburst due to their energy storing capabilities. When subjected to stress and pressure, the coals tend to fail; sometimes violently. Destructive coal outbursts are divided into two categories: pushes and bounces. Pushes are the result of stresses acting upon the coalbed and surrounding strata. They are characterized by an orangish color appearing at the roofline, caused by coal being pulverized between the face and roof, a rapid release of friable coal in a wave-like action originating from a face or rib in a horizontal movement, and usually accompanied with large concentrations of methane gas. The methane gas acts as a propellent for the crushed coal. Pushes generally give a warning, staccato like sounds, immediately before the built-up energy is instantaneously released.

   Bounces are coal outbursts that range from audible sounds, indicating coal is being slowly squeezed and broken, to violent releases of energy that force the mine floor upward in an instantaneous manner that can allow it to contact the mine roof.

8. There were several identifiable sources of stress that influenced the coal outburst: a) the topography of the surface area; b) the amount of the overburden; c) the previously mined out panels diagonally above the 103 longwall section; d) the inconclusive relief from volley firing the face; and e) the overlying Dutch Creek "M" bed with its advancing 211 and 212 longwall sections and associated pressures.

9. The coal outburst, locally known as a push, was of a low range magnitude. This is a subjective scale adopted by those persons familiar with pushes at this mine, based upon experience and accident evidence.

10. The coal outburst accident involved an area approximately 50 feet in length.

11. Ventilation readings were taken in the headgate roadway entry, the conveyor beltline and immediate return entries. There was 183,465 cubic feet of air per minute being delivered to the intake end of the longwall face and 150,220 cubic feet of air per minute was measured in the return air course entry.

FINDINGS OF FACT

The investigation did not reveal any violation of Title 30, Code of Federal Regulations, Part 75, which would have contributed to the cause of the accident.

CONCLUSION

The coal outburst was triggered when a small concentrated area of stress was mined into by the shearer. The stressed area was undetected by visual observations and stress detection practices. The accident occurred in an area where stress forces had not been previously located.

The stress relief program, although very effective, consists of remedial and precautionary measures. Efforts are being taken to control stress in a long range manner on a mine-wide basis through better stress detection and relief measures.

VIOLATIONS

A 103(k) Order was issued and held in effect for the duration of the investigation.

Submitted by:

for David Head
CMS&H Inspector

Approved by:

Tony Sabossi
Acting Subdistrict Manager

Approved by:

William A. Holgate
District Manager

APPENDIX

The investigation was conducted by the Mine Safety and Health Administration and those persons present during the investigation were:

Mid-continent Resources, Inc., Company Officials

Ken Abbott	Faceboss No. 1 Mine, 103 longwall section
Michael Horst	Safety Department

Mine Safety and Health Administration

David L. Head	Coal Mine Safety & Health Inspector (Electrical)

Special Data Sheet

U.S. Department of Labor
Mine Safety and Health Administration

Section A—Information Required in Electrical Accident Reports

1. Voltage of Circuit Involved

2. Voltage to Which Victim was Exposed

3. Type of Supply Circuitry (trolley wire, portable rectifier, wye connected secondary, delta connected secondary)

4. Type, Size and Insulation Rating of Conductor Involved

5. Electrical Protection for Circuit

6. Ground Fault Trip Value (3 phase only)

7. Wiring Diagram of Circuit Involved (attach separate drawing)

8. Condition of Mine Floor

9. Was victim wearing rubber boots?

☐ Yes ☐ No

9a. Condition of Boots

10. Was victim wearing gloves?

☐ Yes ☐ No

10a. Type

10b. Condition

11. Type of Grounding for Equipment

Section B—Information Required in Accidents Involving Equipment

12. Name of Manufacturer of Machine Involved

Eickhoff Shearer

13. Model, Approval Number and Type of Machine

EDW-300-L

14. Machine Voltage

995 V.A.C.

15. Did design of machine contribute to accident?

☐ Yes ☒ No

16. Did maintenance deficiencies contribute to accident?

☐ Yes ☒ No

17. Name of official responsible for maintenance of equipment.

N/A

18. Experience of Operator

5 years

19. Was machine being operated within safe limits of its capability? (if no, explain why)

☐ Yes ☐ No

Section C—Remarks

An unplanned fall of face (coal outburst) accident occurred that was 50 feet in length between the numbers 94 and 105 shields.